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To: Catherine Blewett  
Pour:

Date:

Object: **Aquaculture Technology Study**

NOV 30 2018

From / De: John Campbell, Director General, Aquaculture Management

Via: Philippe Morel, Assistant Deputy Minister, Aquatic Ecosystems

NOV 30 2018

Additional approvals:

Autre(s) approbation(s):

*see attached*

Rebecca Reid  
Regional Director General, Pacific Region



Material for the Minister  
Documents pour le Ministre



Your Signature  
Votre signature



Information

Distribution:

Arran McPherson, Assistant Deputy Minister, Ecosystems and Oceans  
Science

Drafting Officer/  
Rédacteur:

D. Boulet (613-864-5905) / A. Struthers / lk



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**Additional approvals:**

**Autre(s) approbation(s):**

  
**Rebecca Reid, Regional Director General, Pacific Region**

  
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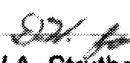
**Your Signature  
Votre signature**



**Information**

**Distribution: Arran McPherson, Assistant Deputy Minister, Ecosystems and Oceans  
Science**

**Andrew Thomson, RD, Fisheries Mgt, Pacific  
Approval Attached**

**Drafting Officer/  
Rédacteur:**   
**D. Boulet (613-864-5905) / A. Struthers / eb**



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Deputy Minister

Sous-ministre

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MEMORANDUM FOR THE MINISTER

**Aquaculture Technology Study  
(FOR DECISION)**

**SUMMARY OF ADVICE TO MINISTER**

The purpose of this note is to seek your approval of proposed Terms of Reference (**TAB 1**) and potential membership (**TAB 4**) for the Steering Committee that will provide oversight on the *State of Salmon Aquaculture Technology Study*, and to outline a proposed path forward to advance the study.

As a result of the ongoing interest to minimize environmental impacts related to salmon farming in British Columbia (B.C.), departmental officials have been working with Sustainable Development Technology Canada, the B.C. government, and others to advance a study on the state of salmon aquaculture technology. The proposed study will analyze the global state of play of salmon aquaculture production technologies, including state of commercialization, and obstacles to full commercialization in Canada. It will focus on environmental impacts of various technologies, social implications, financial modelling (where applicable), and recommendations for a path to successful implementation of various technologies.

It is recommended that the study be guided by a Steering Committee consisting of members from the Department, B.C. government, First Nations, industry, and the environmental non-governmental organization (ENGO) community. A draft Terms of Reference (ToR) (**TAB 1**) for the Steering Committee has been developed for your approval, outlining their scope of work and potential membership. A draft Statement of Work (SoW) (**TAB 2**) has been developed to facilitate preliminary engagement with potential consultants as well as an overview of the proposed study, including a critical path for the completion of the study (**TAB 3**). Officials are targeting the end of May 2019 for completion of the study.

It is recommended that you approve the ToR (**TAB 1**) and the proposed list of Steering Committee members (**TAB 4**), some of whom have already expressed interest in participating. We would be happy to include other names that you feel are relevant for this study.

Should you agree, officials will contact the proposed members to confirm their interest in participating in the Steering Committee.

## **BACKGROUND**

Governments and industry leaders are being pressed to develop innovative ways to decrease the potential risks of salmon aquaculture on the environment. While investments in closed containment technology have been tested, a full examination of the wide range of alternative technologies for aquaculture is necessary to inform the sustainable economic growth of the aquaculture sector.

Certain aquaculture systems or technologies could significantly reduce interactions between aquaculture and the natural environment, such that all growth is contained and, in the case of land based systems, water is continuously treated and re-used. Several other new methods of production are under development globally, including ocean-based closed containment (i.e. solid walled cages) and open-ocean (offshore) aquaculture systems that may become more widely available in the medium-term (5-10 years).

Officials will pursue a study on the global state of salmon production technology with a focus on the B.C. operating environment. It will analyze the state of new aquaculture production technologies, including stage of commercialization and obstacles to full commercialization in Canada, in addition to a brief overview of past technologies.

Departmental officials have held discussions with Sustainable Development and Technology Canada (SDTC) and the Province of B.C. with regards to potential sources of funding for the study. SDTC does not have the in-house expertise to undertake the study, but has agreed to be the financial mechanism to flow funds to a consultant/contractor with the necessary expertise. Both SDTC (\$50K) and the Province of B.C. (unconfirmed amount) have committed to providing financial contributions to the study.

## **STRATEGIC CONSIDERATIONS**

A Steering Committee composed of key stakeholders is recommended to provide independent oversight to the study. The proposed mandate of the Steering Committee would be to approve the main objectives and parameters of the study, facilitate progress on the study by providing subject matter expertise where required, and ensure that the outcome of the study aligns with the project objectives. The Steering Committee will be expected to finalize and agree to the Terms of Reference and approve the SoW that will be used to solicit bids from potential consulting firms.

Proposed representatives for the Steering Committee (**TAB 4**) include representatives from SDTC; Fisheries and Oceans Canada from NHQ and Pacific Region; the B.C. government; B.C. First Nations; the ENGO community; and, industry.

B.C. First Nations have extensive experience in aquaculture either as partners or operators, in both traditional net pen aquaculture and land-based projects. They are a central partner for aquaculture going forward and, therefore, their presence is deemed essential and beneficial to the process.

Two NGO organizations are also proposed for consideration: Tides Canada and the Pacific Salmon Foundation (PSF). Tides Canada is national in scope and supports a range of initiatives from neighbourhood-scale social programs to national conservation efforts. In 2010, Tides Canada established a \$6 million Salmon Aquaculture Fund that supports research and

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demonstration projects of land-based, closed containment aquaculture systems, and associated technologies that offer alternative models to open-net aquaculture.

On the other hand, the PSF is regionally based and focuses its efforts on the conservation and restoration of wild Pacific salmon and their ecosystems. PSF's latest Strategic Plan (2016-2018) outlines its current initiatives which include enhanced engagement with First Nations, supporting Pacific salmon science, engagement in public policy initiatives, and implementation of its Community Salmon Grants Program.

Based on the above analysis, it is recommended that Tides Canada be selected as the ENGO representative for the Steering Committee. Tides is national in scope, has experience with initiatives that cover a diverse range of social and environmental issues, and has experience with aquaculture technologies. You are scheduled to meet with Tides Canada on December 7<sup>th</sup>. This could be an opportunity to invite them to be part of the Steering Committee. Briefing materials for this introductory meeting will follow under separate cover.

Officials will continue working with SDTC and the B.C. officials to finalize details of our partnership should there be a desire to jointly announce the launch of the study in the near future.

#### **ADVICE AND RECOMMENDATIONS TO MINISTER**

It is recommended that you approve the ToR (**TAB 1**) and the proposed list of Steering Committee members (**TAB 4**); members identified at the federal, provincial, First Nations and industry level have already expressed interest in participating. We also recommend that Tides Canada be selected as the ENGO representative for the Steering Committee.

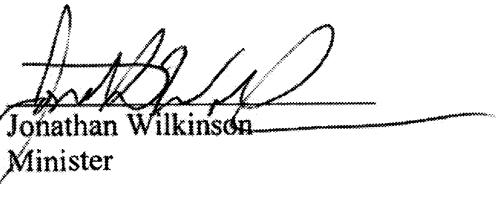
Should you concur, officials will contact the proposed representatives to confirm their interest in participating in the Steering Committee. Subsequent to your decision, officials will finalize the Steering Committee membership and plan a first meeting of the Committee.

Catherine Blewett  
Deputy Minister

  
Kevin Stringer  
Associate Deputy Minister

DEC 04 2018

I concur with the recommendations  
 I do not concur with the recommendations

  
Jonathan Wilkinson  
Minister

Minister's Comments:

.../4

Attachments: (4)

- 1) State of Salmon Aquaculture Technology – Draft ToR (EKME# 3991269)
- 2) State of Salmon Aquaculture Technology – Draft SoW (EKME# 3991291)
- 3) State of Salmon Aquaculture Technology – Summary and Critical Path  
(EKME# 3991292)
- 4) Proposed Membership for Steering Committee (EKME# 3992622)

## **TERMS OF REFERENCE FOR STATE OF SALMON AQUACULTURE TECHNOLOGY PROJECT STEERING COMMITTEE**

### **PURPOSE**

There is a strong interest from the government, industry, non-government organizations and Indigenous peoples to accelerate technology development and innovation to minimize environmental impacts related to salmon farming in British Columbia.

A joint study will be undertaken on the global state of salmon aquaculture technology with a focus on the BC operating environment. It will analyze the global state of play of new salmon aquaculture production technologies, evaluate their economic feasibility and environmental and social impacts, and recommend pathways for enhanced environmental protection and sustainable growth of the aquaculture sector in Canada.

### **MANDATE**

The mandate of the Steering Committee will be to approve the main objectives and parameters of the study, facilitating progress on the study by providing subject matter expertise where required, and ensuring the outcome of the study aligns with the project objectives.

### **SCOPE OF WORK**

The Steering Committee will provide a forum to review all relevant points of view in the design phase of the study. It will also ensure a valid and independent process.

The Steering Committee will be required to:

- Review and adjust the objectives and parameters of the study prior to study commencement;
- Approve the Statement of Work (SoW) for an independent third-party contractor to undertake the work;
- Provide subject matter expertise where required;
- Consult with their stakeholders to provide input representing the views of their constituents;
- Review the draft report provided by the contractor, comment and suggest modifications;
- Address issues that may arise during the execution of the study; and,
- Review and provide comments on the final draft to ensure the study has achieved its objective.

### **MEMBERSHIP**

The Steering Committee will be comprised of:

- One Sustainable Development Technology Canada (SDTC) representative;
- One Fisheries and Oceans Canada representative from NHQ;
- One Fisheries and Oceans Canada representative from Pacific Region;
- One BC government representative;

- BC First Nations Fisheries Council representative(s);
- Tides Canada representative(s); and,
- BC Salmon Farmers Association representative(s).

Each member will identify a designated alternate(s). For continuity purposes and to ensure that the Committee is able to provide the necessary advice to fulfill its role, attendance will be limited to the members and their designated alternates.

#### **EXPERT INVITEES**

Subject matter experts may be invited to meetings of the Committee. Such expertise could include representation from Indigenous groups, academia, industry or ENGOs where appropriate.

#### **CHAIRPERSON**

The DFO NHQ representative will fulfill the role of Chair for the Steering Committee.

#### **MEETINGS**

The Steering Committee will meet three (3) times. The purpose of the first meeting will be:

1. To review the project objectives and process and suggest a notional SoW;
2. To review the draft SOW and agree on revisions;
3. To adopt the final SOW and process.

The Committee will convene at least twice more throughout the duration of the study.

#### **MEETING LOGISTICS**

Participation on the Steering Committee will be on a voluntary basis. Meetings will be completed by conference call, as such, there will be no travel required. Secretarial functions such as recording meeting minutes, coordinating conference calls, and drafting necessary documents (e.g. Statement of Work) will be performed by DFO.

## **Statement of Work**

### **1.0 Scope**

#### **1.1 Title**

**Study on State of Salmon Aquaculture Technology**

#### **1.2 Introduction**

There is a strong interest from the government, industry, non-government organizations and Indigenous peoples to accelerate technology development and innovation to minimize environmental impacts related to salmon farming in British Columbia. In particular, closed containment technologies have been identified as being of special interest. While some limited investments in closed containment technology have been tested, a full examination of the wide range of alternative technologies for salmon aquaculture is necessary to enable the sustainable economic growth of the aquaculture sector.

Certain aquaculture systems or technologies could significantly reduce interactions between aquaculture and the natural environment, such that all growth is contained and, in the case of land based systems, most water is continuously treated and re-used. Several other new methods of production are under development globally, including ocean-based closed containment (i.e., solid walled cages) and open-ocean (offshore) aquaculture systems, and may become more widely available in the short- to medium-term.

Some economic, environmental and social implications of adopting these new technologies are unknown. Further investigation is necessary to establish the trade-offs associated with such an adoption.

#### **1.3 Objectives of the Requirement**

To analyze the global state of play of new salmon aquaculture production technologies; identify obstacles to full commercialization in Canada; and recommend pathways to successful adoption of new technologies.

#### **1.4 Estimated Value**

This contract will be subject to a formal, objective process led by Sustainable Development Technology Canada through which the best ranking firm will be awarded the contract.

#### **1.5 Background, Assumptions and Specific Scope of the Requirement**

A study will be undertaken on the global state of salmon production technology under development with a focus on the BC operating environment. It will analyze the global state of play of new salmon aquaculture production technologies, including state of commercialization, and obstacles to full

commercialization in Canada, in addition to a brief overview of past technologies. It will also include:

- An overview of the current state of technologies, currently existing and under development, for salmon aquaculture production, including a broad analysis of the economics of these technologies;
- A qualitative analysis of the environmental impacts (costs, benefits, savings, mitigations, etc.) of commercial and near-market ready technologies, with a particular emphasis on comparison to current net pen aquaculture;
- An analysis of social implications including job creation and impacts on coastal/rural communities;
- A financial modelling of current net pens, land based closed containment (full cycle), land-based closed containment (large smolts + delayed sea-cage entry), ocean-based closed containment and/or other technologies as identified;
- A sensitivity analysis of the commercially available technologies; and
- Recommendations on addressing the identified obstacles and establishing a path to success with specific actions.

## **2.0 Requirements**

### **2.1 Tasks, Activities, Deliverables and Milestones**

Task	Expected date	Lead/Support
Work Plan, Team and Roles	February 2019	Contractor
Research	March 2019	Contractor
Draft Report	March 2019	Contractor
Draft Report Review	April 2019	Steering Committee
Final Report	April 2019	Contractor
Review/Approval by Steering Committee	May 2019	Steering Committee
Final Approval by DFO	June 2019	DFO

Note: The contractor may be required, when needed and in agreement with the Departmental Representative, to liaise with departmental personnel to obtain information and advice on the development of new content on Canadian aquaculture methods and techniques (e.g. DFO Regional Aquaculture Coordinators, DFO Strategic and Regulatory Science Directorate).

### **2.2 Specifications and Standards**

The choice of tools and the format of documents to perform the work will be at the discretion of the contractor. However, when sharing documents with government officials, the contractor will be required to use formats that are technically compatible with GOC programs (e.g., Word, Excel, PDF). All documents will be submitted using email.

### **2.3 Technical, Operational and Organizational Environment**

The work will be conducted by the contractor, not using DFO sites or equipment. The contractor's work will not be conducted on DFO premises. While the end user of this work will be DFO, the ultimate end user of new content will be the public.

#### **2.4 Project Management Control Procedures and Source of Acceptance**

The contractor will participate in email exchanges and conference calls with the Department, as needed. The departmental representative will control the work through those email exchanges and conference calls as well as review of documents. Any change in scope will be developed in discussion between the contractor and DFO and determined by the Steering Committee.

The determination of the acceptability of the work will be made by the Steering Committee upon receipt of first draft, revised drafts, and final document. Some measures for this assessment include completeness, clarity, and accuracy.

Payment will be provided in two phases: 50% upfront and 50% upon completion of the final report. Payment will require a receipt or an invoice from the contractor following the completion of each of these two phases.

#### **2.5 Ownership of Intellectual Property**

**The Crown will own IP - DFO will retain ownership of the intellectual property of the final report.**

## **State of Salmon Aquaculture Technology – Summary and Critical Path**

There is ongoing interest from the government, industry, non-government organizations and Indigenous peoples to accelerate technology development and innovation to minimize environmental impacts related to salmon farming in British Columbia (B.C.). In particular, closed containment technologies have been identified as being of special interest. While investments in closed containment technology have been tested, a full examination of the wide range of alternative technologies for salmon aquaculture is necessary to inform the sustainable economic growth of the aquaculture sector.

Certain aquaculture systems or technologies could reduce interactions between aquaculture and the natural environment, such that all growth is contained and, in the case of land based systems, most water is continuously treated and re-used. Several other new methods of production are under development globally, including ocean-based closed containment (i.e., solid walled cages) and open-ocean (offshore) aquaculture systems, and may become more widely available in the medium-term (5-10 years).

Some economic, environmental and social implications of adopting these new technologies are unknown. Further investigation is necessary to establish the trade-offs associated with such an adoption.

### **Proposed Study:**

A joint study will be undertaken on the global state of salmon aquaculture technology with a focus on the B.C. operating environment. It will analyze the **global state of play** of new salmon aquaculture production technologies, evaluate their economic feasibility and environmental and social impacts, and recommend pathways for enhanced environmental protection and sustainable growth of the aquaculture sector in Canada. It will also include:

- An overview of the current state of technologies, currently existing and under development, for salmon aquaculture production, including a broad analysis of the economics of these technologies;
- A qualitative analysis of the environmental impacts (costs, benefits, savings, mitigations, etc.) of commercial and near-market ready technologies, with a particular emphasis on comparison to net pens;
- An analysis of social implications including job creation and impacts on coastal/rural communities;
- A financial modelling of current net pens, land based closed containment (full cycle), land-based closed containment (large smolts + delayed sea-cage entry), ocean-based closed containment and/or other technologies as identified;
- A sensitivity analysis of the commercially available technologies; and
- Recommendations on addressing the identified obstacles and establishing a path to success with specific actions.

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**Proposed Timelines and process:**

Task	Expected date	Lead/Support
<b>Phase 1 – Groundwork</b>		
Identify Sources of Funding	Complete	DFO/SDTC
Identify Potential Contractors	30/11/18	DFO
Establish Steering Committee (SC)	07/12/18	DFO
<b>Phase 2 – Study Design</b>		
Draft SoW for Review by SC	Complete	DFO
Kick-off Meeting	14/12/18	Steering Committee
Finalize SoW	21/12/18	DFO/Steering Committee
Contract Issuance	18/01/19	SDTC
<b>Phase 3 – Execution</b>		
Work Plan, Team and Roles	01/02/19	Contractor
Research	01/03/19	Contractor
Draft Report	29/03/19	Contractor
Draft Report Review	05/04/19	Steering Committee
Final Report	19/04/19	Contractor
Review/Approval by Steering Committee	01/05/19	Steering Committee
Final Approval by DFO	17/05/19	DFO

**Process**

1. 
2. The process will be led by DFO, but SDTC will be the main mechanism to channel the funds to issue the contract for the project.
3. The study design and progress will be overseen by an equal, independent Steering Committee made up of various interests. The steering committee will approve the Statement of Work for an independent third-party contractor to undertake the work.
4. Once the Steering Committee is established, they will be responsible for approving their Terms of Reference and the Statement of Work to pursue a consultant to undertake the study.
5. Potential firms are:

International Firms	Canadian Independent Consultants
• Boston Consulting Group (BCG)	• Gardner Pinfold Consulting
• McKinsey & Company	• Canadian Aquaculture Systems
• Deloitte	• JLH Consulting

**PROPOSED MEMBERSHIP FOR  
STATE OF SALMON AQUACULTURE TECHNOLOGY PROJECT STEERING COMMITTEE**

1. Sustainable Development Technology Canada – [REDACTED]
2. Fisheries and Oceans Canada – Alistair Struthers (HQ), Adrienne Paylor (Pacific Region)
3. Government of British Columbia – Myron Roth
4. First Nations Fisheries Council – [REDACTED]
5. Tides Canada – TBD
6. BC Salmon Farmers Association – [REDACTED]

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